

On Wednesday morning the reading of papers was resumed, Mr. E. F. Boyd again presiding. The following is a brief notice of the papers overtaken :—

1. "On the Economical Advantages of Mechanical Ventilation," by Mr. D. P. Morison. The author stated that tabulated results of experiments recently made showed that the saving effected in the consumption of fuel varied in most cases from 40 to 80 per cent. in favour of mechanical ventilation as compared with furnace ventilation. The latter had other disadvantages, such as (1) the danger of an open fire in a fiery seam; (2) in order to avoid that danger, the necessity and serious cost of constructing a dumb drift to convey the return air to the upcast shaft, and the fact that a large amount of fresh air is required to feed the furnaces, while it is of no value in the workings themselves; (3) the serious fact that the upcast shaft, being usually heated to nearly its practical maximum, cannot, in cases of necessity (such as a sudden fall of the barometer, an unexpected occurrence of a large discharge of fire-damp, or a block in the air-ways), be made at once available for an increased duty; (4) the inordinate wear and tear upon furnaces, arches, bars, and the shaft lining, whether brick-casing or tubbing, and in case of a coal-drawing upcast shaft, the deterioration of the ropes, guides, cages, and other plant. In no case could the furnace compete successfully with mechanical ventilation. Even in the deepest of English mines the advantage of mechanical ventilation is shown by the economy in fuel being from 35 to 40 per cent. over that required for furnace ventilation. Mr. Morison described various mechanical ventilators, including those of Struve, Nasmyth, Lemielle, Waddle, Guibal, and others. He expressed himself as most in favour of the Guibal ventilating fan, the one most in use both on the Continent and in this country. An interesting discussion followed Mr. Morison's paper, remarks being made by Messrs. Lupton (Leeds), Steavenson (Durham), William Cochrane and Simpson (Newcastle), Barclay (Kilmarnock), Marley (Darlington), Harvey (Glasgow), and others.

2. "On J. Grafton Jones's Coal-getting Machine," by Mr. Arnold Lupton, Leeds. After describing the machine in question, and specially dwelling upon its involving the use of the hydraulic wedge and a drilling apparatus, Mr. Lupton claimed for it the following advantages :—1st, The safety with which mines can be worked by it as a substitute for gunpowder; 2nd, The superior shape of coal got by the wedge as compared with that got by blowing, and the less amount of slack made; 3rd, The improvement in the health of the miners likely to ensue on the disuse of gunpowder; 4th, The saving in labour by using the hydraulic wedge instead of hammer-driven wedges; 5th, The saving in labour and diminution in the amount of slack made by using the hydraulic machine to push the coal out of the solid, in working those seams whose nature is such as to render it possible. Mr. Lupton stated that Jones's powerful machine is now in use, pushing coal out of the solid without any holing or natural breaks in the seam, at Kiveton Park Colliery, in South Yorkshire. The seam is five feet thick, and the coal is very hard, but by the use of the hydraulic wedge blocks are got four yards long and four feet wide—each about eight tons weight—at one application of the machine. In the course of the discussion which followed various other important and interesting facts were evoked.

3. "On an Expansive Double-cylinder Pumping Machine," by Mr. Andrew Barclay, Kilmarnock.

4. "On an Expansive, High-pressure, Cut-off Slide Valve," by the same.

5. "On a New Coal-getting Machine," by Mr. George Simpson, Glasgow. The author of this paper dwelt at some length on the working of coal on the "long-wall" system by machinery, and then explained the nature of the machinery which he thought most suitable for it. The essential feature of the machine, exhibited and described by Mr. Simpson, is a somewhat saw-like blade which works into the face of the coal seam in a horizontal manner. Mr. Simpson said it was indispensable that the tool to be used should be durable and easily removed and replaced in case of blunting or breakage, and he claimed that his cutter possessed those qualifications. He also showed an application of an endless chain for driving the proposed machinery, and which might be worked by an engine on the drawing road at the face of the coal, or from the bottom of the shaft or other convenient point.

6. "On the Utilisation of Blast Furnace Gases, Coal being used as the Fuel," by Mr. William Ferrie, Monklands, Iron and Steel Works, Lanarkshire. The author stated that it had occurred

to him that if raw coal could be coked in the blast furnace as in a common gas retort, the difficulty of withdrawing the furnace gases for use would be overcome, and he immediately commenced experiments with a small blast furnace, one-fifteenth of the capacity of a 50-foot furnace. The upper part was divided into two compartments or retorts into which the coal, ores, and limestone flux were charged; and the top of the furnaces was closed in by the ordinary bell and cone arrangement, as in the Cleveland district. The gases passed off into a main which communicated by two pipes, one to each side of the furnace, to the entrance of the flues at the bottom of the retorts, and were ignited by the aid of atmospheric air. These flues were spiral, in order that the heat from the burning gases might permeate the materials inside the retorts, while the exhaust gases were thrown off by chimneys at the top of the retorts. This small furnace was worked for about two months with raw coal only as fuel, and the results were highly satisfactory, notwithstanding that the furnace was so small in size. Being convinced that this plan of working a furnace was practicable, Mr. Ferrie had forthwith commenced the alteration of one of the ordinary furnaces at Monkland Works, which he said would be ready for operating with at the end of the month of August.

7. "On Mineral Oil Works," by Mr. David Cowan. The author referred to the manufacture of mineral oils as one of the leading industries of Scotland; to the nature and extent of the oil yielding materials, namely, bituminous shales and cannel coals, distributed throughout the Scottish coal measures; and to the quantity and quality of the produce from those materials. He afterwards described the mode of treating the raw materials, referring to the horizontal and the vertical retorts used in Scotland, comparing their advantages and disadvantages, and then described an arrangement of apparatus designed to combine the advantages of both kinds of retorts, and which would at the same time admit of improved facilities of workings. In order to improve the mode of firing, Mr. Cowan suggested that instead of coal the retorts should be heated with gas flame, and further, that the system of first converting the fuel into gas (as successfully worked out by Siemens) should be adopted. He estimated that the mode of heating by gas in this way would effect a saving of from 40 to 50 per cent. of the fuel.

The time allotted for reading and discussing papers having now arrived, the president announced that those papers which had not been overtaken, would become the joint property of the two institutions. They will doubtless be published along with the others in the transactions to be issued by each institution. The afternoon was spent in the same way as that of the preceding day; and in the evening a grand banquet was held, at which the members of the North of England Institute were the principal guests. Thursday was occupied in visiting collieries, iron-works, engineering, ship-building, chemical, and other manufacturing establishments at a distance from Glasgow; and on Friday there was an excursion on the saloon steamer Chancellor down the Clyde to Dunoon, and thence up Lochlong to Arrochar, from which the party walked or rode over to Tarbet, on Loch Lomond, a distance of about two miles. The visitors were then conveyed by one of the Loch Lomond Company's steamers to the top of that loch, "The Queen of Scottish lakes," where dinner was served. In the afternoon the whole length of the loch was traversed by Balloch, where the party took train and returned by the Dumbartonshire Railway to Glasgow. All the visitors were greatly delighted with the magnificent scenery along this route, as well as with the kindness, attention, and hospitality shown to them during their four days' sojourn in the "land o' cakes." Altogether, a very great degree of pleasure was experienced both by the members of the North of England Institute and by the members of the Scottish Institution. Not unlikely a return visit will soon be paid to the "Coaly Tyne."

JOHN MAYER

SCIENTIFIC SERIALS

THE *Revue des Cours Scientifiques*, for August 13, commences with a translation of Dr. Carpenter's lecture on the Temperature and Animal Life of the Deep Sea. This is followed by a report of Prof. Milne-Edwards's address in *comité secret* of the Academy in favour of the election of Mr. Darwin as corresponding member, the substance of which we gave last week. The last paper is M. Ed. von Beneden's very important and interesting article on *commensalisme*, or "fellow-boarding," as it has been termed, in the animal kingdom, extracted from the proceedings of the Bel-

gian Academy of Sciences, a translation of which has already been published in this country. The current number for August 20 opens with an article *à propos* of the war, a translation of Prof. Shaw's address to the Military College at Sandhurst on the war establishments of Great Britain. We have then the continuation of M. Marey's paper on the Flight of Birds; and, in conclusion, under the head of "Bibliography," a translation of Mr. Wallace's review of Mr. J. J. Murphy's "Habit and Intelligence," which appeared in our columns.

THE *American Entomologist and Botanist* publishes a double number for July and August, which is occupied by short descriptive articles of interest and value principally to American collectors and students. The article of chief general interest is one on the "Origin of Prairie Vegetation," consisting of an able criticism of Prof. Winchell's theory that the prairies are of lacustrine origin, and that we must look to the source of the prairie vegetation from without,—probably the remains of a pre-glacial flora, the germs of which have remained stored up during subsequent epochs, and come again to life whenever the diluvial surface is again exposed. The writer of the article maintains that there is no need to go so far back as the diluvial period for the origin of the prairie vegetation. Dr. Hale, of Chicago, mentions the interesting fact that the *Ranunculus cymbalaria*, an abundant plant of the eastern sea coast and of the salt springs in the State of New York, is found in great abundance at Chicago, and for several miles along the shores of Lake Michigan, though nowhere else on the Great Lakes. It appears, however, that it also grows on the muddy banks of some of the western rivers.

THE *Geological Magazine* for the present month (No. 74), contains only three original articles, namely, one by Mr. D. Mackintosh on the Dispersion of Shapfell Boulders, and Origin of Boulder Clay; a second by Mr. John Hopkinson on the structure and affinities of *Dicranograptus* (with a plate), including descriptions and figures of the British species of that genus, two of which (*D. formosus* and *D. nicholsoni*) are described as new; and a memoir, with two plates, by Mr. T. Davidson, on Italian Tertiary Brachiopoda, with an important table of the species and their geological distribution. Among the abstracts and notices of memoirs, is a report of an interesting lecture on the Primæval Rivers of Britain, by Professor T. Rupert Jones.

Mittheilungen aus Justus Perthes' Geographischer Anstalt (vol. xvi., No. 8) opens with a remarkably interesting paper—illustrated by a map—by Dr. G. Nachtigal, on his travels in Tibesti. He says that, in spite of Barth's philological investigations, he regards the question as to the nature of the Tibbu as still undecided. They are of middle height, are very well built, and possess elegant yet muscular limbs. The majority of them are of a deep bronze colour, but without a trace of what is usually termed the negro physiognomy. On the whole, their physical and psychical peculiarities, their social and political arrangements, and their manners and customs, resemble those of the Berber infinitely more than those of the Negro. Amongst other things, Dr. Nachtigal records some careful observations of the rivers Zuar and Marmar, the former of which he regards as incomparably the finest river in Tibesti. In M. Lejean's article on his own travels in European Turkey in 1869, he corrects the existing maps in several points, embodying in an elaborate map the results of his investigations. He expresses the greatest contempt for the modern Turks, intimating that those who believe they have recently made real progress are deceived by mere appearances. He says he has gathered full materials for a work or works on the ethnography and archaeology of the districts he describes. Professor Pellegrino Strobel describes a journey from the Planchar Pass to Mendoza; and the rest of the number is made up of "Geographical Notices" and translations of extracts from Mr. Robert Brown's "Physical Geography of the Queen Charlotte Islands," and from reports published in the "South Australian Register," on Mr. G. W. Gogden's Measuring Expedition to North Australia.

SOCIETIES AND ACADEMIES

BRISTOL

Observing Astronomical Society.—Report of observations made by the members during the period from July 7th to August 6th, 1870, inclusive:—*Solar Phenomena*.—Mr. Thomas G. E. Elger, of Bedford, reports that the sun spots observed in

July exceeded in number those recorded during the previous month, but they were, with a few exceptions, small (less than 30" in diameter), and although pretty equally distributed between the two hemispheres, those to the south of the sun's equator presented a remarkable contrast, both in type and size, to those observed to the north of it; the former, as in June, included some large scattered groups and moderately sized spots of the normal class, while the latter consisted chiefly of solitary specks without penumbrae, and clusters of minute black punctures which frequently assumed very grotesque configurations. A striking feature of the large groups observed during the early part of the month was an evident tendency either to close up or to become dissociated upon reaching a certain position on the disc—about half way between the E. limb and the centre. On the 25th one of the largest groups observed this year appeared at the E. limb; on the 28th it measured nearly 5' in length, and consisted of a large preceding spot 1' 10" in diameter, followed by a straggling train of "wispy" penumbrae enclosing several small spots. This group dwindled away very rapidly after the 28th. Another large spot, about 50" in diameter, was observed from July 13th—25th.

Fresh groups observed in the sun's N. hemisphere during July	9
Fresh groups observed in the sun's S. hemisphere during July	12
Maximum number of groups on disc	12
	(July 13, 5 ^h 30 ^m)
Minimum number of groups on disc	4
	(July 28, 5 ^h 10 ^m)

Mr. Albert P. Holden, of London, says, "I observed a very interesting spot on June 21, at 7 A.M. The penumbra was unusually pale, and the umbra of a decided light brown hue. Four darker openings arranged in a square were observed in the umbra, and were readily seen with a very small aperture. A very remarkable circumstance in connection with the sun spots during the last two months has been their extremely light colour. The light brown tints of the umbra have been very marked, and totally different from the dark hues they usually present; while, at times, the penumbrae have been so light as to be scarcely visible. In most of them, however, the nucleus (which is ordinarily so difficult to detect) has been very easily seen, as in the case of the foregoing observation. The fact proves the phenomenon seen to be due to the actual lightening of the spots themselves, because if it were merely an optical or atmospheric effect, the whole spot would be lighter and the nucleus would be quite as difficult to detect as before. It is probable that these appearances may be a necessary result of the maximum of sun-spot activity, and are due (as suggested by Mr. Lockyer) to the thinness of the solar envelope at the present time. This would certainly account for the light hues of the umbrae and penumbrae, and also for the frequency and blackness of the nucleus." Mr. Henry Ormesher, of Manchester, writes, "On the 31st of July, from 2^h 15^m to 3^h 0^m, while looking at the sun with my 3 in. refractor, I saw a beautiful large cluster of spots occupying an almost central position on the disc. It occurred to me that the umbra in the largest spot appeared more dense on the western side. I therefore determined to examine it with my 5½ in. refractor. I did so, using a power of 181. The result was that it resolved itself into a very fine nucleus of a somewhat oval shape. After making myself sure that the above was the case I examined the cluster generally, and was struck with the beautiful appearance of the brighter part of the sun's atmosphere. A very bright stream ran across the cluster, in a zigzag direction, separating the penumbra. Some parts of this stream, and particularly the upper part, appeared brighter than others, presenting a very mottled appearance."—Mr. William F. Denning, of Bristol, observed the sun, with his 3 in. refractor, on July 14, from 5^h 30^m to 6^h 10^m. He noticed nine large well-defined *maculae* on various parts of the disc. A particularly large and interesting group of spots was visible in the N. hemisphere. On July 22, at 8 P.M., a spot was observed in the same hemisphere, which was divided by two bridges of light. He noticed that the penumbra was invaded by numerous minute lines of light, and that the bridges seemed to present the appearance of running matter. This observation was made with power 100 and 10½ in. reflector by Browning.

The Lunar Eclipse of July 12.—The Rev. Ralph Prowde, of Northallerton, Yorkshire, observed this phenomenon, and has forwarded the following:—"I observed the eclipse of the moon